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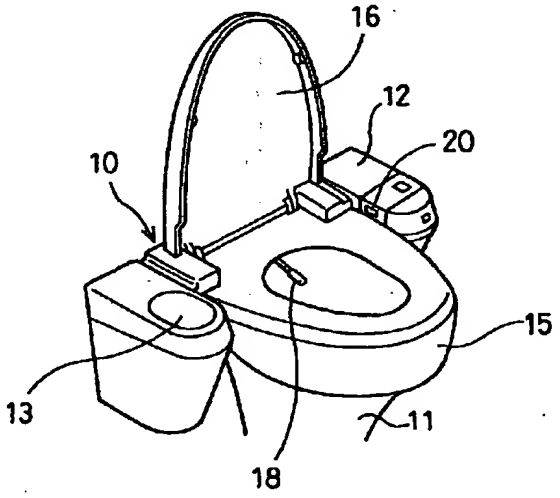
(54)【発明の名称】　赤外線反射式センサ及びこれを用いた便器

(57)【要約】

【課題】　着座センサ２０は、保護板２４に近い位置にある検知対象物を検出することができ、保護板２４の反射の影響をなくし検知精度を高める。

【解決手段】　着座センサ２０は、発光素子２２と、受光素子２３と、保護板２４とを備えており、発光素子２２から発せられる赤外光の投光エリアＲ１と、受光素子２３が受光する範囲を受光エリアＲ２とし、これらが重なる範囲を感知エリアＲ３としている。保護板２４の透過部２５は、感知エリアＲ３に重なるように配置されている。また、保護板２４は、その内表面２５ａ及び外表面２５ｂでの反射光が受光素子２３に向かわないようにセンサ基板２１に対して角度θｋで傾いて配置されている。



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【特許請求の範囲】
【請求項1】　赤外光を発する発光素子と、この発光素子から離れて設置された受光素子と、光透過性の材料からなり受光素子及び発光素子から離れて設置され該受光素子及び発光素子を保護するための保護部材とを備え、
上記発光素子から発せられかつ保護部材を通った赤外光のうち検知対象物で反射した反射光を上記受光素子で受光することにより、該検知対象物を検知する赤外線反射式センサにおいて、
上記発光素子は、その中心から第1角度の範囲で広がる赤外光が発せられる投光エリアを形成するように配置され、
上記受光素子は、その中心から第2角度の範囲の赤外光を受光する受光エリアを形成するとともに、該受光エリアと上記投光エリアとが重なる領域を感知エリアとしたとき、該感知エリア内に上記検知対象物があるときに反射光を受光するように配置され、
上記保護部材は、上記発光素子から発する赤外光が透過する透過部を備え、該透過部は、少なくともその一部が上記感知エリア内に入るように配置されるとともに、該透過部で反射される赤外光が上記受光素子側へ向かわないように構成されていること、
を特徴とする赤外線反射式センサ。
【請求項2】　請求項1において、
上記透過部は、該透過部で反射される赤外光が受光素子側へ向かわない角度で配置された板材である赤外線反射式センサ。
【請求項3】　請求項1において、
上記透過部は、上記発光素子側である内側の表面が該発光素子を中心にして半球面に形成されている赤外線反射式センサ。
【請求項4】　請求項1または請求項2において、
上記透過部は、上記発光素子と反対側である外側の表面が該発光素子を中心にして半球面に形成されている赤外線反射式センサ。
【請求項5】　赤外光を発する発光素子と、この発光素子から離れて設置された受光素子と、光透過性の材料からなり受光素子及び発光素子から離れて設置され該受光素子及び発光素子を保護するための保護部材とを備え、
上記発光素子から発せられた赤外光のうち検知対象物で反射した反射光を上記受光素子で受光することにより、該検知対象物を検知する赤外線反射式センサにおいて、
上記発光素子は、その中心から第1角度の範囲で広がる赤外光が発せられる投光エリアを形成するように配置され、
上記受光素子は、その中心から第2角度の範囲の赤外光を受光する受光エリアを形成するとともに、該受光エリアを上記投光エリアに重なる感知エリアとし、該感知エリア内に上記検知対象物があるときに反射光を受光するように配置され、

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上記保護部材は、上記発光素子から発する赤外光が透過する透過部を備え、該透過部は、少なくともその一部が上記感知エリア内に入るように配置されるとともに、上記透過部と受光素子との間に上記透過部と同じ屈折率の材料から形成された充填材を備えたこと、
を特徴とする赤外線反射式センサ。
【請求項6】　人体の局部に向けて洗浄水を噴出する衛生洗浄装置を備え、該衛生洗浄装置による洗浄水の噴出指令を制御するための着座センサに上記請求項1ないし請求項5のいずれかの赤外線反射式センサを用いたことを特徴とする便器。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】本発明は、洋式便器への着座の有無を検知する着座センサなどに使用される赤外線反射式センサ及びこれを用いた便器に関する。
【0002】
【従来の技術】従来、この種の赤外線反射式センサとして、赤外光を発する発光素子と、赤外光を受光する受光素子とを備え、該発光素子から発せられる赤外光が検知対象物に反射され、その反射光を受ける受光素子の検知信号に基づいて検知対象物の有無を検知するセンサが知られている（特開平6－101260号公報）。
【0003】図14は赤外線反射式センサ100を示す概略構成図である。図14において、赤外線反射式センサ100は、ケーシング102と、このケーシング102に形成された収納凹所104に収納された発光素子106と、上記ケーシング102に形成された収納凹所108に収納された受光素子110と、ケーシング102に対して距離L1だけ離して設置された保護板112とを備えている。上記保護板112は、光透過性のアクリル板から形成されており、発光素子106や受光素子110などの内部部品の保護や外観の向上を図っている。
【0004】上記赤外線反射式センサ100では、発光素子106を中心に角度θ1で発せられる範囲が投光エリアR1となり、受光素子110を中心とした角度θ2の範囲が受光エリアR2となっている。そして、投光エリアR1と受光エリアR2とが重なる領域を感知エリアR3（破線で示す部分）とし、感知エリアR3内に検知対象物Tが入ると、発光素子106からの光は、経路g1を経て検知対象物Tの表面で乱反射して、経路g2を経て受光素子110に入る。このとき、受光素子110からの検知信号が所定以上になると検知対象物Tがあると判定している。
【0005】しかし、上記赤外線反射式センサ100では、図15に示すように、検知対象物Tが感知エリアR3より保護板112側に近接した位置にあり、つまり感知エリアR3から外れると、発光素子106からの赤外光のうちもっとも受光素子110を通る赤外光、つまり経路g3から経路g4を経る赤外光であっても、受光素

子１１０に入らず、検知対象物Ｔを検知することができない。

【０００６】これを解決するために、図１６に示すように、保護板１２０を発光素子１０６及び受光素子１１０から距離Ｌ２まで離して、保護板１２０を感知エリアＲ３にかかるように配置する手段がある。

【０００７】

【発明が解決しようとする課題】しかし、保護板１２０を距離Ｌ２まで遠くすると、設置スペースが大きくなるという問題があるだけでなく、発光素子１０６から発した赤外光のうち経路ｇ５を経た赤外光が保護板１２０の反射点ｐ１で反射して、経路ｇ６を経て受光素子１１０に入射する。このため、検知対象物Ｔが感知エリアＲ３内にないにもかかわらず、検知対象物Ｔを誤って検知するという問題があった。

【０００８】本発明は、上記従来の技術の問題を解決するものであり、発光素子及び受光素子に近接した位置にある検知対象物を検知することができるとともに、検知対象物の検知精度を向上させた赤外線反射式センサ及びこれを用いた便器を提供することを目的とする。

【０００９】

【課題を解決するための手段およびその作用・効果】上記課題を解決するためになされた請求項１の発明は、赤外光を発する発光素子と、この発光素子から離れて設置された受光素子と、光透過性の材料からなり受光素子及び発光素子から離れて設置され該受光素子及び発光素子を保護するための保護部材とを備え、上記発光素子から発せられかつ保護部材を通った赤外光のうち検知対象物で反射した反射光を上記受光素子で受光することにより、該検知対象物を検知する赤外線反射式センサにおいて、上記発光素子は、その中心から第１角度の範囲で広がる赤外光が発せられる投光エリアを形成するように配置され、上記受光素子は、その中心から第２角度の範囲の赤外光を受光する受光エリアを形成するとともに、該受光エリアと上記投光エリアとが重なる領域を感知エリアとし、該感知エリア内に上記検知対象物があるときに反射光を受光するように配置され、上記保護部材は、上記発光素子から発する赤外光が透過する透過部を備え、該透過部は、少なくともその一部が上記感知エリア内に入るように配置されるとともに、該透過部で反射される赤外光が上記受光素子側へ向かわないように構成されていること、を特徴とする。

【００１０】第１の発明では、発光素子は、その中心から第１角度の範囲で赤外光を発して、その範囲を投光エリアとするように配置されており、また、受光素子は、その中心から第２角度の範囲の赤外光を受光する受光エリアを形成するように配置されている。そして、投光エリアと受光エリアとが重なる範囲が感知エリアとなっており、該感知エリアに検知対象物があると、発光素子で発した赤外光は、検知対象物で乱反射して受光素子で受光される。これにより、検知対象物が検知される。

【００１１】また、保護部材は、発光素子及び受光素子から離れて配置されて発光素子及び受光素子を保護しているが、光透過性の材料で形成されているので、発光素子からの赤外光を通すための検知対象物の検知の妨げとならない。また、保護部材は、感知エリアの一部にかかるように配置されているので、該保護部材に近接した位置に検知対象物があっても、これを検知することができる。

【００１２】さらに、保護部材は、発光素子から発する赤外光が透過する透過部を備え、この透過部は、該透過部で反射される赤外光が受光素子へ向かわないように形成されている。したがって、発光素子から発した赤外光が透過部で反射することがなく、つまり検知対象物以外で反射した赤外光が受光素子で入らないから、受光素子から誤った検知信号が出力されることがない。

【００１３】なお、保護部材の透過部の好適な態様として、保護部材を板材で形成し、この保護部材を傾斜した角度に設置する構成とすることにより実現できる。

【００１４】また、透過部の他の好適な態様として、透過部の表面を、発光素子を中心にして半球面に形成する。これにより、透過部の表面で反射した赤外光は、発光素子へ戻り、受光素子側へ向かわない。

【００１５】第２の発明は、保護部材の透過部と発光素子との間に、透過部とほぼ同じ屈折率の材料から形成された充填材を設けたものであり、充填材は、透過部とほぼ同じ屈折率を有しているから、透過部の表面で反射が生じることがなく、その影響に伴う誤った検出結果を生じない。

【００１６】なお、本発明にかかる赤外線反射式センサは、各種のものに適用することができるが、例えば、人体の局部に向けて洗浄水を噴出する衛生洗浄装置において、その洗浄水の噴出指令を制御するための検出信号を出力する着座センサに用いることができる。この着座センサは、人体との接触を防止するために保護部材を使用しているから好適に適用できる。

【００１７】

【発明の実施の形態】以上説明した本発明の構成・作用を一層明らかにするために、以下本発明の好適な実施例について説明する。

【００１８】図１は本発明の一実施の形態に係る赤外線反射式センサを着座センサとして利用した衛生洗浄装置付き洋式便器の外観図である。図１に示すように、衛生洗浄装置１０は、洋式便器１１に装着されるものであり、ケース本体１２と、ケース本体１２の袖部に設けられた操作部１３と、ケース本体１２に回動自在に支持された便座１５及び便蓋１６と、温水を吐水する洗浄用ノズル１８と、を備えている。

【００１９】また、衛生洗浄装置１０のケース本体１２の内側部には、着座センサ２０が取り付けられている。

この着座センサ２０は、赤外線反射式センサであり、便座１５に人が着座したときに検知信号を出力するものである。この検知信号は、たとえば、洗浄用ノズル１８から洗浄水の噴出を許可する信号として使用される。

【００２０】図２は着座センサ２０を示す概略構成図、図３及び図４はその検知動作を説明する説明図である。図２において、着座センサ２０は、センサ基板２１と、発光素子２２と、受光素子２３と、保護板２４とを主要な構成としている。センサ基板２１には、収納凹所２６及び収納凹所２７が形成されており、上記収納凹所２６内に発光素子２２が設置され、上記収納凹所２７に受光素子２３が設置されている。

【００２１】上記収納凹所２６は、収納凹所２７より深く形成されるとともに、該収納凹所２６の開口２６ａ及び収納凹所２７の開口２７ａは、保護板２４とほぼ平行であり、センサ基板２１の底面２１ａに対して角度θｋで傾斜している。

【００２２】また、上記保護板２４は、アクリル樹脂からなる光透過性の板材であり、発光素子２２からの赤外光を乱反射させないように平滑な面となっており、赤外光が透過する透過部２５を有している。

【００２３】上記着座センサ２０において、発光素子２２が赤外光を発する投光エリアＲ１は、発光素子２２の中心点Ｃｐａを中心にして開口２６ａから角度θａで広がる範囲であり、一方、受光素子２３が受光する受光エリアＲ２は、受光素子２３の点Ｃｐｂを中心にして開口２７ａから角度θｂで広がる範囲である。そして、投光エリアＲ１と受光エリアＲ２とが重なる範囲が図２の破線で表される感知エリアＲ３で表わされる。上記保護板２４は、感知エリアＲ３の一部を含むように配置されている。

【００２４】図５は着座センサ２０の検知回路３０を示すブロック図である。図５において、着座センサ２０の検知回路３０の動作を説明する。いま、駆動回路３１より発光素子２２に電力が連続的または周期的に供給され、発光素子２２より赤外光が発せられる。このとき、感知エリアＲ３（図２参照）内に検知対象物Ｔがあると、赤外光は反射して受光素子２３に入射される。受光素子２３は、入射された光の強さに応じて微弱な電気信号を出力する。この電気信号は、増幅回路３２で増幅されて比較器３３の一方の入力端子に入力される。比較器３３の他方の端子には、基準電圧回路３４の基準電圧が入力される。比較器３３は、検知信号が上記基準電圧を上回ったときにハイレベルの信号を出力することで、検知対象物Ｔを検知する。

【００２５】次に、着座センサ２０による検知動作について説明する。図３において、検知対象物Ｔ１が感知エリアＲ３内にあると、発光素子２２からの赤外光は、検知対象物Ｔ１で乱反射して、その一部の反射光が受光素子２３に入り、受光素子２３で電気信号に変換される。

受光素子２３からの電気信号は、図５で説明した検知回路３０により電気的に処理されて検知対象物Ｔ１が検知される。

【００２６】また、保護板２４が感知エリアＲ３の一部を横切るように配置されており、保護板２４に近接した位置も感知エリアＲ３となっている。したがって、保護板２４の付近に検知対象物Ｔ２が位置する、いわゆる近点検知も行なうことができる。

【００２７】次に、発光素子２２からの赤外光が保護板２４で反射することに伴う検知動作の影響について説明する。図４において、発光素子２２から発する赤外光は、保護板２４上の内表面２５ａのうち投光エリアＲ１と重なりあう反射面Ｆ１で反射する。この反射面Ｆ１のうち受光素子２３に近い点Ｐ１が発光素子２２へ一番近づく経路Ｇ１となる。ここで、保護板２４の内表面２５ａは、十分に滑らかであり乱反射しないとすると、経路Ｇ１を経た赤外光は、点Ｐ１における法線Ｌａに対して、入射角θｉｎ１と等しい反射角θｏｕｔ１で反射する。

【００２８】ここで、反射角θｏｕｔ１は、受光素子２３に対して離れる方向が正となるように、つまり、経路Ｇ１と反射面Ｆ１とのなす角度α１が９０°以上となるように、保護板２４が角度θｋで傾斜して配置されている。

【００２９】したがって、反射面Ｆ１上の点Ｐ１で反射した赤外光は、受光素子２３から離れた方向へ向かう。同様に、赤外光が経路Ｇ２を経て、受光素子２３より離れた反射面Ｆ１における点Ｐ２で反射すると、角度α２が９０°より大きくなるから受光素子２３に対していっそう離れた方向へ向かう。このように、発光素子２２から発した赤外光は、受光素子２３に向かうことがなく、誤った検知動作を行なわない。なお、保護板２４の外表面２５ｂにおける反射も、内表面２５ａと同じであるから、その影響はない。

【００３０】図６は第２実施の形態にかかる着座センサ２０Ｂを示す構成図である。図６において、着座センサ２０Ｂは、センサ基板２１Ｂ及び保護板２４Ｂの形状が異なる点以外は、第１実施の形態と同じ構成である。すなわち、センサ基板２１Ｂでは、発光素子２２を収納する収納凹所２６Ｂと、受光素子２３を収納する収納凹所２７Ｂとが同じ形状であり、つまり収納凹所２６Ｂと収納凹所２７Ｂの深さ及び開口２６Ｂａ及び開口２７Ｂａの形状が同じであり、その間の隔壁部２８を中心に対称になっている。このような着座センサ２０Ｂの構成により、投光エリアＲ１及び受光エリアＲ２は、角度θａで同じ形状であり、感知エリアＲ３は、投光エリアＲ１と受光エリアＲ２の中央部に形成される。

【００３１】また、上記保護板２４Ｂは、センサ基板２１Ｂの底面２１ａと平行に配置されている。上記保護板２４Ｂのうち発光素子２２に対向する部分であって、感知エリアＲ３と重なる部分は、透過部２５Ｂになってい

る。すなわち、透過部２５Ｂの内表面２５Ｂａ及び外表面２５Ｂｂは、発光素子２２の中心点Ｃｐａを中心した半球面になっている。

【００３２】次に、着座センサ２０Ｂの検知動作について説明する。図７において、検知対象物Ｔ１が感知エリアＲ３内にあると、発光素子２２からの赤外光は、経路Ｇ３で示すように保護板２４Ｂの透過部２５Ｂを透過した後に、検知対象物Ｔ１の表面で乱反射し、再度、保護板２４Ｂを通過して受光素子２３に入射する。これにより、検知対象物Ｔが着座センサ２０Ｂにより検知される。

【００３３】このように発光素子２２からの赤外光は、保護板２４Ｂの透過部２５Ｂを直進するが、図８に示すように、その一部が保護板２４Ｂの内表面２５Ｂａで反射する。しかし、透過部２５Ｂの内表面２５Ｂａは、発光素子２２の中心点Ｃｐａを中心にした半球面であるから、透過部２５Ｂで反射するすべての反射光は、発光素子２２に向かう。したがって、保護板２４Ｂで反射する反射光は、受光素子２３に入射されることがなく、誤った検知結果を生じない。

【００３４】なお、図６などを用いて説明した第２実施の形態では、保護板２４Ｂの透過部２５Ｂを半球面に形成したが、これに限らず、図９に示す第３実施の形態にかかる着座センサ２０Ｃであってもよい。つまり、着座センサ２０Ｃの保護板２４Ｃの透過部２５Ｃは、反射光を受光素子２３に向かわせないように反射させればよいことから、透過部２５Ｃの受光素子２３側の一部だけを球面状としてもよい。

【００３５】次に、第４実施の形態にかかる図１０及び図１１に示す着座センサ２０Ｄについて説明する。図１０において、着座センサ２０Ｄのセンサ基板２１Ｄは、図６の第２実施の形態と同じであるが、保護板２４Ｄの形状が異なっている。すなわち、保護板２４Ｄは、その板厚ｔＤが図６の保護板２４Ｂより厚くして赤外光の減衰量を大きくしているとともに、透過部２５Ｄの形状を異にしている。すなわち、保護板２４Ｄは、やや厚めの光透過性のアクリル板を用いて、透過部２５Ｄの内表面２５Ｄａを切削して半球面状の凹面としている。

【００３６】ここで、検知対象物の検知動作は、上述した第１実施の形態と同じであるので、保護板２４Ｄでの反射の影響について説明する。保護板２４Ｄの内表面２５Ｄａにおいて、発光素子２２からの赤外光は、すべて発光素子２２へ向かい、受光素子２３へ入射されることがない。一方、保護板２４Ｄの外表面２５Ｄｂにおいて、発光素子２２からの赤外光の一部が反射して、受光素子２３に向かう。しかし、赤外光は、保護板２４Ｄ内で経路ｕ１，ｕ２を通過した際に、その経路ｕ１，ｕ２が長いから減衰量が大きく、受光素子２３に向かう光量がきわめて小さくなる。したがって、保護板２４Ｄの外表面２５Ｄｂによる反射光の影響がない。なお、検知対象物から反射される赤外光の光量は、透過部２５Ｄの外表面２５Ｄｂで反射される光量よりも大きいので、透過部２５Ｄの減衰に伴う検知動作に支障がない。

【００３７】次に、第５実施の形態にかかる図１２及び図１３に示す着座センサ２０Ｅについて説明する。図１２において、着座センサ２０Ｅは、保護板２４Ｅの形状と、センサ基板２１Ｅと保護板２４Ｅとの間のスペースに充填材２９を充填した構成が上述した実施の形態と異なっている。すなわち、保護板２４Ｅの透過部２５Ｅの外表面２５Ｅｂは、半球状になっている。また、上記充填材２９は、保護板２４Ｅと同じ屈折率の光透過性の材料（例えば、アクリル樹脂、　　）から形成されている。

【００３８】上記着座センサ２０Ｅによれば、透過部２５Ｅの外表面２５Ｅｂが発光素子２２の中心点Ｃｐａを中心とした半球面となっており、その外表面２５Ｄｂでの反射光はすべて発光素子２２に向かい、受光素子２３に向かわないことから、透過部２５Ｅの外表面２５Ｅｂでの反射の影響はない。

【００３９】一方、透過部２５Ｅの内表面２５Ｅａ側のスペースには、充填材２９が充填されており、この充填材２９の材料は、保護板２４Ｅと同じ屈折率の材料である。このため、透過部２５Ｅの内表面２５Ｅａで赤外光が反射せず、受光素子２３に向かわないから、その影響がない。なお、充填材２９は、発光素子２２及び受光素子２３を含めた保護板２４Ｅのスペースのすべてに充填するほか、受光素子２３へ向かう経路の周辺だけに充填してもよい。

【００４０】なお、この発明は上記実施例に限られるものではなく、その要旨を逸脱しない範囲において種々の態様において実施することが可能である。

【図面の簡単な説明】

【図１】本発明の一実施の形態にかかる赤外線反射式センサを着座センサ２０に用いた衛生洗浄装置１０を示す斜視図。

【図２】第１実施の形態にかかる着座センサ２０を説明する説明図。

【図３】着座センサ２０の検知動作を説明する説明図。

【図４】保護板２４の反射光の影響を説明する説明図。

【図５】着座センサ２０の検知回路３０を説明するブロック図。

【図６】第２実施の形態にかかる着座センサ２０Ｂを説明する説明図。

【図７】着座センサ２０Ｂの検知動作を説明する説明図。

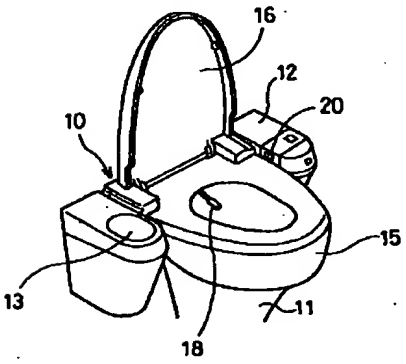
【図８】保護板２４Ｂの反射光の影響を説明する説明図。

【図９】第３実施の形態にかかる着座センサ２０Ｃを説明する説明図。

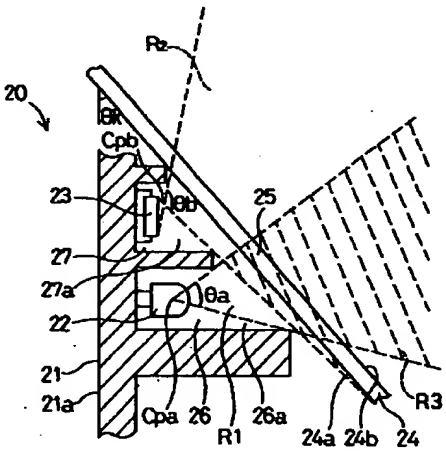
【図１０】第４実施の形態にかかる着座センサ２０Ｄを

説明する説明図。
【図11】保護板24Dの反射光の影響を説明する説明図。
【図12】第5実施の形態にかかる着座センサ20Eを説明する説明図。
【図13】保護板24Eの反射光の影響を説明する説明図。
【図14】従来の赤外線反射式センサ100を説明する説明図。
【図15】赤外線反射式センサ100の課題を説明する説明図。
【図16】従来の他の赤外線反射式センサ100Pを説明する説明図。
【符号の説明】
T，T1，T2…検知対象物
F1…反射面
R1…投光エリア
R2…受光エリア
R3…感知エリア
10…衛生洗浄装置
11…洋式便器
12…ケース本体
13…操作部
15…便座
16…便蓋
18…洗浄用ノズル
20…着座センサ
20，20B～20E…着座センサ
21，21B～21E…センサ基板
21a…底面
22…発光素子
23…受光素子
24，24B～24E…保護板
25，25B～25E…透過部
25a，25Ba，25Da，25Ea…内表面
25b，25Bb，25Db，25Eb…外表面
26，26B…収納凹所
26a，26Ba…開口
27，27B…収納凹所
27a，27Ba…開口
28…隔壁部
29…充填材
30…検知回路
31…駆動回路
32…増幅回路
33…比較器
34…基準電圧回路

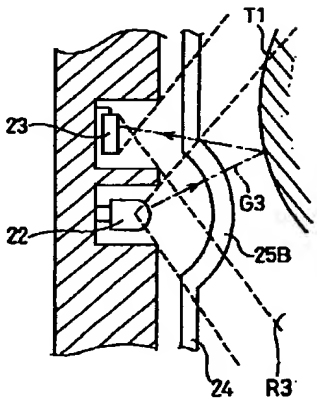
【図1】



【図2】



【図7】



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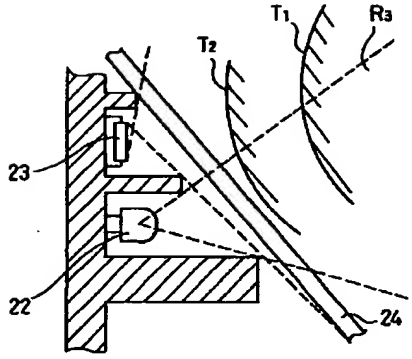

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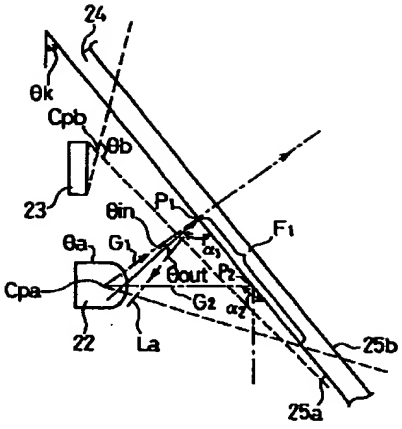

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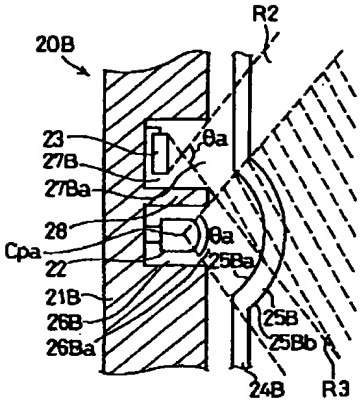

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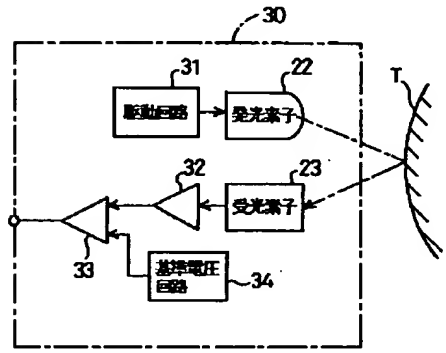

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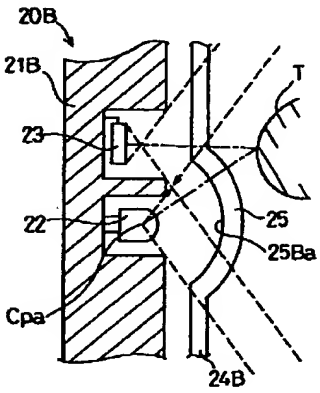

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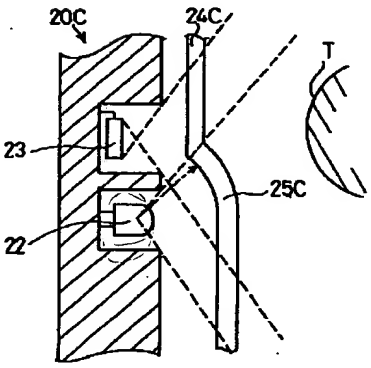

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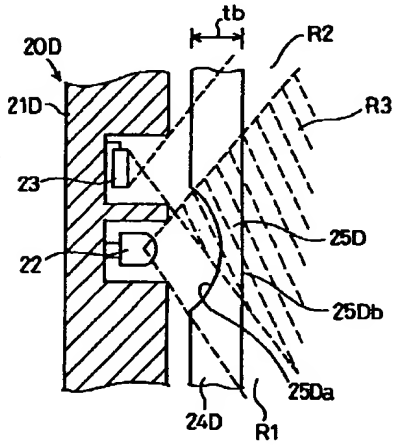
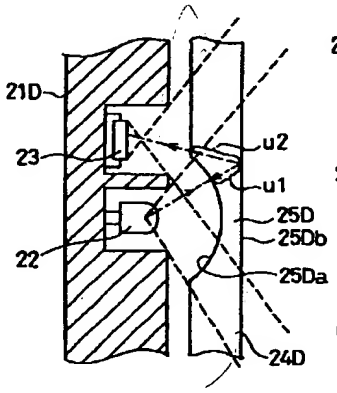
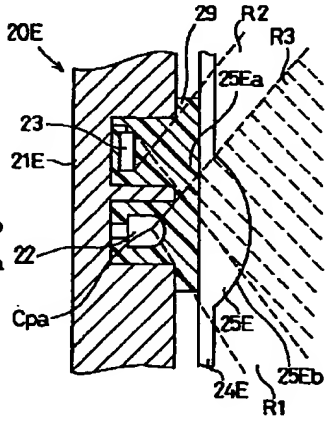


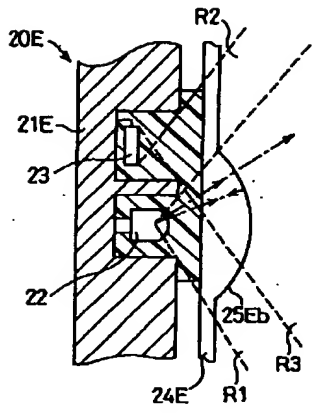
【図11】



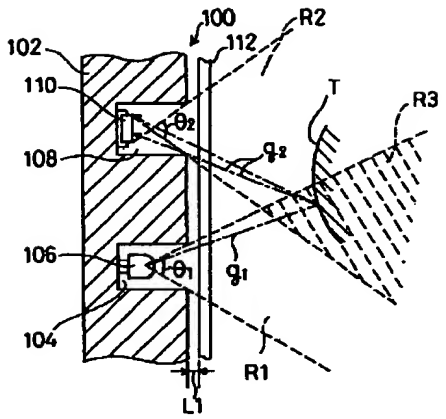
【図12】



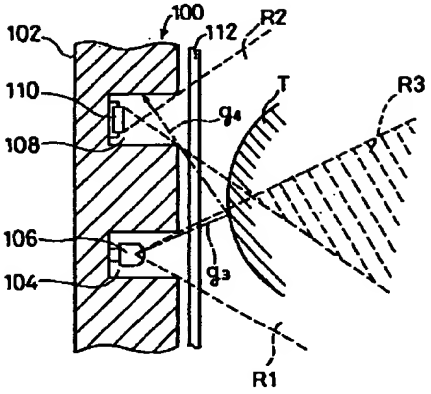
【図13】



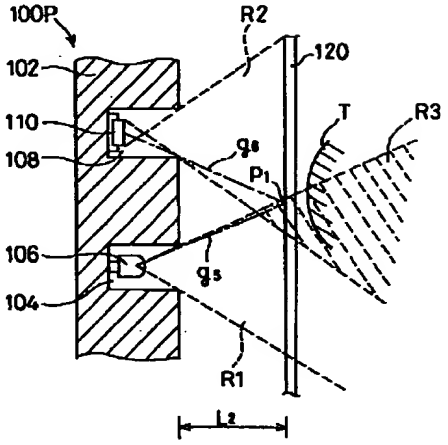
【図14】



【図15】



【図16】



CLAIMS

[Claim(s)]
[Claim 1] The light emitting device which emits infrared light, and the photo detector left and installed from this light emitting device, It has a protection member for consisting of an ingredient of light transmission nature, being separated and installed from a photo detector and a light emitting device, and protecting this photo detector and a light emitting device. By receiving the reflected light reflected with the detection object among the infrared light which was emitted from the above-mentioned light emitting device, and passed along the protection member by the above-mentioned photo detector In the infrared reflective type sensor which detects this detection object the above-mentioned light emitting device It is arranged so that the floodlighting area where the infrared light which spreads in the range of the 1st include angle from the core is emitted may be formed. The above-mentioned photo detector While forming the light-receiving area which receives the infrared light of the range of the 2nd include angle from the core It is arranged so that the reflected light may be received when the field with which this light-receiving area and the above-mentioned floodlighting area lap is made into sensing area, and the above-mentioned detection object is in this sensing area. The above-mentioned protection member It has the transparency section which the infrared light emitted from the above-mentioned light emitting device penetrates. This transparency section The infrared reflective type sensor characterized by being constituted so that the infrared light reflected in this transparency section may not go to the above-mentioned photo detector side, while being arranged so that the part may enter in the above-mentioned sensing area at least.
[Claim 2] It is the infrared reflective type sensor which is the plate arranged at the include angle at which the infrared light in which the above-mentioned transparency section is reflected in this transparency section in claim 1 does not go to a photo detector side.
[Claim 3] It is the infrared reflective type sensor by which the inside front face whose above-mentioned transparency section is the above-mentioned light emitting device side in claim 1 is formed in the semi-sphere side focusing on this light emitting device.
[Claim 4] It is the infrared reflective type sensor by which the front face of the outside whose above-mentioned transparency sections are the above-mentioned light emitting device and the opposite side in claim 1 or claim 2 is formed in the semi-sphere side focusing on this light emitting device.
[Claim 5] The light emitting device which emits infrared light, and the photo detector left and installed from this light emitting device, It has a protection member for consisting of an ingredient of light transmission nature, being separated and installed from a photo detector and a light emitting device, and protecting this photo detector and a light emitting device. By receiving the reflected light reflected with the detection object among the infrared light emitted from the above-mentioned light emitting device by the above-mentioned photo detector In the infrared reflective type sensor which detects this detection object the above-mentioned light emitting device It is arranged so that the floodlighting area where the infrared light which spreads in the range of the 1st include angle from the core is emitted may be formed. The above-mentioned photo detector While forming the light-receiving area which receives the infrared light of the range of the 2nd include angle from the core This light-receiving area is made into the sensing

area which laps with the above-mentioned floodlighting area, and it is arranged so that the reflected light may be received, when the above-mentioned detection object is in this sensing area. The above-mentioned protection member It has the transparency section which the infrared light emitted from the above-mentioned light emitting device penetrates. This transparency section The infrared reflective type sensor characterized by having the filler formed from the ingredient of the same refractive index as the above-mentioned transparency section between the above-mentioned transparency section and a photo detector while having been arranged so that the part may enter in the above-mentioned sensing area at least.

[Claim 6] The toilet bowl characterized by using the infrared reflective type sensor of either above-mentioned claim 1 thru/or claim 5 for the taking-a-seat sensor for having the health washing station which spouts wash water towards the part of the body, and controlling the jet command of the wash water by this health washing station.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the toilet bowl using the infrared reflective type sensor and this which are used for the taking-a-seat sensor which detects the existence of taking a seat to a foreign style toilet bowl.
[0002]
[Description of the Prior Art] It has conventionally the light emitting device which emits infrared light, and the photo detector which receives infrared light as this kind of an infrared reflective type sensor, the infrared light emitted from this light emitting device is reflected by the detection object, and the sensor which detects the existence of a detection object based on the detection signal of the photo detector which receives that reflected light is known (JP,6-101260,A).
[0003] Drawing 14 is the outline block diagram showing the infrared reflective type sensor 100. The infrared reflective type sensor 100 is equipped with casing 102, the light emitting device 106 contained by the receipt hollow 104 formed in this casing 102, the photo detector 110 contained by the receipt hollow 108 formed in the above-mentioned casing 102, and the guard plate 112 with which only distance L1 was detached and installed to casing 102 in drawing 14 . The above-mentioned guard plate 112 is formed from the acrylic board of light transmission nature, and is aiming at protection of internal components, such as a light emitting device 106 and a photo detector 110, and improvement in an appearance.
[0004] By the above-mentioned infrared reflective type sensor 100, the range emitted at an include angle theta 1 focusing on a light emitting device 106 serves as the floodlighting area R1, and the range of the include angle theta 2 centering on a photo detector 110 serves as the light-receiving area R2. And if the field with which the floodlighting area R1 and the light-receiving area R2 lap is made into the sensing area R3 (part shown with a broken line) and the detection object T enters in the sensing area R3, the light from a light emitting device 106 will be reflected irregularly on the front face of the detection object T through a path g1, and will go into a photo detector 110 through a path g2. At this time, if the detection signal from a photo detector 110 becomes more than predetermined, it will have judged with there being a detection object T.
[0005] However, even if it is the infrared light which passes along a photo detector 110 by the above-mentioned infrared reflective type sensor 100 most among the infrared light from a light emitting device 106 when it is in the location where the detection object T approached the guard-plate 112 side from the sensing area R3, that is, separates from the sensing area R3, as shown in drawing 15 , i.e., the infrared light which passes through a path g4 from a path g3, it cannot go into a photo detector 110 and the detection object T cannot be detected.
[0006] In order to solve this, as shown in drawing 16 , a guard plate 120 is detached from a light emitting device 106 and a photo detector 110 to distance L2, and there is a means to arrange a guard plate 120 so that the sensing area R3 may be started.
[0007]
[Problem(s) to be Solved by the Invention] However, if a guard plate 120 is made far to distance L2, the infrared light which passed through the path g5 among the infrared light

emitted from the light emitting device 106 will reflect with the reflective spot p1 of a guard plate 120, and there is not only a problem that an installation tooth space becomes large, but it will carry out incidence to a photo detector 110 through a path g6. For this reason, although there was no detection object T into the sensing area R3, there was a problem of detecting the detection object T accidentally.

[0008] This invention solves the problem of the above-mentioned Prior art, and it aims at offering the toilet bowl using the infrared reflective type sensor and this which raised the detection precision of a detection object while it can detect the detection object in the location close to a light emitting device and a photo detector.

[0009]

[The means for solving a technical problem, and its operation and effectiveness] Invention of claim 1 made in order to solve the above-mentioned technical problem The light emitting device which emits infrared light, and the photo detector left and installed from this light emitting device, It has a protection member for consisting of an ingredient of light transmission nature, being separated and installed from a photo detector and a light emitting device, and protecting this photo detector and a light emitting device. By receiving the reflected light reflected with the detection object among the infrared light which was emitted from the above-mentioned light emitting device, and passed along the protection member by the above-mentioned photo detector In the infrared reflective type sensor which detects this detection object the above-mentioned light emitting device It is arranged so that the floodlighting area where the infrared light which spreads in the range of the 1st include angle from the core is emitted may be formed. The above-mentioned photo detector While forming the light-receiving area which receives the infrared light of the range of the 2nd include angle from the core The field with which this light-receiving area and the above-mentioned floodlighting area lap is made into sensing area, and it is arranged so that the reflected light may be received, when the above-mentioned detection object is in this sensing area. The above-mentioned protection member It has the transparency section which the infrared light emitted from the above-mentioned light emitting device penetrates, and this transparency section is characterized by being constituted so that the infrared light reflected in this transparency section may not go to the above-mentioned photo detector side while it is arranged so that the part may enter in the above-mentioned sensing area at least.

[0010] In the 1st invention, a light emitting device emits infrared light in the range of the 1st include angle from the core, it is arranged so that the range may be made into floodlighting area, and the photo detector is arranged so that the light-receiving area which receives the infrared light of the range of the 2nd include angle from the core may be formed. And if the range with which floodlighting area and light-receiving area lap serves as sensing area and a detection object is in this sensing area, the infrared light emitted by the light emitting device will be reflected irregularly with a detection object, and will be received by the photo detector. Thereby, a detection object is detected.

[0011] Moreover, although the protection member separated, has been arranged from the light emitting device and the photo detector and has protected the light emitting device and the photo detector, since it is formed with the ingredient of light transmission nature, it does not serve as hindrance of detection of the detection object for letting the infrared light from a light emitting device pass. Moreover, since the protection member is arranged so that a part of sensing area may be started, even if a detection object is in the

location close to this protection member, it can detect this.
[0012] Furthermore, a protection member is equipped with the transparency section which the infrared light emitted from a light emitting device penetrates, and this transparency section is formed so that the infrared light reflected in this transparency section may not go to a photo detector. Therefore, since the infrared light which the infrared light emitted from the light emitting device did not reflect in the transparency section, that is, was reflected except the detection object does not enter by the photo detector, the detection signal which was mistaken from the photo detector is not outputted.
[0013] In addition, as a suitable mode of the transparency section of a protection member, a protection member is formed by the plate and it can realize by considering this protection member as the configuration installed in the inclined include angle.
[0014] Moreover, the front face of the transparency section is formed in a semi-sphere side focusing on a light emitting device as other suitable modes of the transparency section. Thereby, the infrared light reflected on the front face of the transparency section does not go to a return and photo detector side to a light emitting device.
[0015] The 2nd invention prepares the filler formed from the ingredient of the almost same refractive index as the transparency section between the transparency section of a protection member, and a light emitting device, and since the filler has the almost same refractive index as the transparency section, it does not produce the detection result made the mistake in reflection not producing on the front face of the transparency section, and following on the effect.
[0016] In addition, although the infrared reflective type sensor concerning this invention is applicable to various kinds of things, it can be used for the taking-a-seat sensor which outputs the detecting signal for controlling the jet command of the wash water, for example in the health washing station which spouts wash water towards the part of the body. Since the protection member is used in order to prevent contact on the body, this taking-a-seat sensor is suitably applicable.
[0017]
[Embodiment of the Invention] In order to clarify further a configuration and an operation of this invention explained above, the suitable example of this invention is explained below.
[0018] Drawing 1 is the external view of the foreign style toilet bowl with a health washing station which used the infrared reflective type sensor concerning the gestalt of 1 operation of this invention as a taking-a-seat sensor. As shown in drawing 1 , the foreign style toilet bowl 11 is equipped with the health washing station 10, and it is equipped with the case body 12, the control unit 13 prepared in the housing part of the case body 12, the seat 15 and the toilet lid 16 which were supported by the case body 12 free [rotation], and the nozzle 18 for washing which carries out the discharged water of the warm water.
[0019] Moreover, the taking-a-seat sensor 20 is attached in the inside section of the case body 12 of the health washing station 10. This taking-a-seat sensor 20 is an infrared reflective type sensor, and when people sit down to the seat 15, it outputs a detection signal. This detection signal is used as a signal with which jet of wash water is permitted from the nozzle 18 for washing.
[0020] The outline block diagram in which drawing 2 shows the taking-a-seat sensor 20,

drawing 3 , and drawing 4 are the explanatory views explaining the detection actuation. In drawing 2 , the taking-a-seat sensor 20 is considering the sensor substrate 21, the light emitting device 22, the photo detector 23, and the guard plate 24 as main configurations. The receipt hollow 26 and the receipt hollow 27 are formed in the sensor substrate 21, a light emitting device 22 is installed in the above-mentioned receipt hollow 26, and the photo detector 23 is installed in the above-mentioned receipt hollow 27.

[0021] The above-mentioned receipt hollow 26 is almost parallel to a guard plate 24, and inclines by include-angle thetak to base 21a of the sensor substrate 21 while it is formed more deeply than the receipt hollow 27. [of opening 26a of this receipt hollow 26 and opening 27a of the receipt hollow 27]

[0022] Moreover, the above-mentioned guard plate 24 is the plate of the light transmission nature which consists of acrylic resin, it serves as a smooth field so that scattered reflection of the infrared light from a light emitting device 22 may not be carried out, and it has the transparency section 25 which infrared light penetrates.

[0023] In the above-mentioned taking-a-seat sensor 20, the floodlighting area R1 where a light emitting device 22 emits infrared light is range which spreads in opening 26a to include-angle thetaa centering on the central point Cpa of a light emitting device 22, and, on the other hand, the light-receiving area R2 which a photo detector 23 receives is range which spreads in include-angle thetab from opening 27a focusing on the point Cpb of a photo detector 23. And the range with which the floodlighting area R1 and the light-receiving area R2 lap is expressed in the sensing area R3 expressed with the broken line of drawing 2 . The above-mentioned guard plate 24 is arranged so that a part of sensing area R3 may be included.

[0024] Drawing 5 is the block diagram showing the detecting circuit 30 of the taking-a-seat sensor 20. In drawing 5 , actuation of the detecting circuit 30 of the taking-a-seat sensor 20 is explained. Now, power is supplied to a light emitting device 22 continuously or periodically from the drive circuit 31, and infrared light is emitted from a light emitting device 22. If the detection object T is in the sensing area R3 (refer to drawing 2) at this time, it will reflect and incidence of the infrared light will be carried out to a photo detector 23. A photo detector 23 outputs a feeble electrical signal according to the intensity of light by which incidence was carried out. This electrical signal is amplified in an amplifying circuit 32, and is inputted into one input terminal of a comparator 33. The reference voltage of the reference voltage circuit 34 is inputted into the other-end child of a comparator 33. A comparator 33 is outputting a high-level signal, when a detection signal exceeds the above-mentioned reference voltage, and it detects the detection object T.

[0025] Next, the detection actuation by the taking-a-seat sensor 20 is explained. In drawing 3 , if the detection object T1 is in the sensing area R3, the infrared light from a light emitting device 22 is reflected irregularly with the detection object T1, and a part of the reflected lights will go into a photo detector 23, and it will be changed into an electrical signal by the photo detector 23. The electrical signal from a photo detector 23 is electrically processed by the detecting circuit 30 explained by drawing 5 , and the detection object T1 is detected.

[0026] Moreover, it is arranged so that a guard plate 24 may cross a part of sensing area R3, and the location close to a guard plate 24 also serves as the sensing area R3. Therefore, the so-called near-point detection in which the detection object T2 is located

near a guard plate 24 can also be performed.
[0027] Next, the effect of the detection actuation accompanying the infrared light from a light emitting device 22 reflecting with a guard plate 24 is explained. In drawing 4 , the infrared light emitted from a light emitting device 22 is reflected in the reflector F1 which overlaps the floodlighting area R1 among internal-surface 25a on a guard plate 24. The point P1 near a photo detector 23 serves as the path G1 which approaches a light emitting device 22 most among this reflector F1. Here, supposing internal-surface 25a of a guard plate 24 is fully smooth and it does not reflect it irregularly, it will reflect the infrared light which passed through the path G1 to the normal La in a point P1 by angle-of-reflection thetaout1 equal to incident angle thetain1.
[0028] Here, a guard plate 24 inclines by include-angle thetak, and angle-of-reflection thetaout1 is arranged so that the include angle alpha 1 of a path G1 and a reflector F1 to make may become 90 degrees or more, so that the direction left to a photo detector 23 may serve as forward that is,.
[0029] Therefore, the infrared light reflected the point P1 on a reflector F1 goes in the direction distant from the photo detector 23. If similarly infrared light reflects through a path G2 at the point P2 in the reflector F1 distant from the photo detector 23, since an include angle alpha 2 becomes larger than 90 degrees, it will go in the direction further distant to the photo detector 23. Thus, the infrared light emitted from the light emitting device 22 does not perform detection actuation which was mistaken toward the photo detector 23. In addition, since the reflection in outside-surface 25b of a guard plate 24 is the same as internal-surface 25a, the effect does not exist.
[0030] Drawing 6 is the block diagram showing taking-a-seat sensor 20B concerning the gestalt of the 2nd operation. In drawing 6 , taking-a-seat sensor 20B is the same configuration as the gestalt of the 1st operation except the point that the configurations of sensor substrate 21B and guard-plate 24B differ. That is, in sensor substrate 21B, receipt hollow 26B which contains a light emitting device 22, and receipt hollow 27B which contains a photo detector 23 are the same configurations, that is, the configuration of the depth of receipt hollow 26B and receipt hollow 27B, opening 26Ba, and opening 27Ba is the same, and has become the symmetry focusing on the septum section 28 in the meantime. Of such a configuration of taking-a-seat sensor 20B, the floodlighting area R1 and the light-receiving area R2 are the configurations same at include-angle thetaa, and the sensing area R3 is formed in the center section of the floodlighting area R1 and the light-receiving area R2.
[0031] Moreover, the above-mentioned guard-plate 24B is arranged in parallel with base 21a of sensor substrate 21B. It is the part which counters a light emitting device 22 among the above-mentioned guard-plate 24B, and the part which laps with the sensing area R3 has become transparency section 25B. That is, internal-surface 25Ba of transparency section 25B and outside-surface 25Bb are the semi-sphere side which carried out the core of the central point Cpa of a light emitting device 22.
[0032] Next, detection actuation of taking-a-seat sensor 20B is explained. In drawing 7 , if the detection object T1 is in the sensing area R3, as path G3 shows, after it penetrates transparency section 25of guard-plate 24B B, the infrared light from a light emitting device 22 is reflected irregularly on the front face of the detection object T1, and again, it will pass guard-plate 24B and it will carry out incidence to a photo detector 23. Thereby, the detection object T is detected by taking-a-seat sensor 20B.

[0033] Thus, although the infrared light from a light emitting device 22 goes transparency section 25of guard-plate 24B B straight on, as shown in drawing 8 , the part reflects by internal-surface 25Ba of guard-plate 24B. However, since internal-surface 25Ba of transparency section 25B is a semi-sphere side centering on the central point Cpa of a light emitting device 22, all the reflected lights reflected by transparency section 25B go to a light emitting device 22. Therefore, the reflected light reflected by guard-plate 24B does not produce the detection result which incidence is not carried out to a photo detector 23, and was mistaken.

[0034] In addition, although transparency section 25of guard-plate 24B B was formed in the semi-sphere side with the gestalt of the 2nd operation explained using drawing 6 etc., you may be taking-a-seat sensor 20C concerning the gestalt of the 3rd operation shown not only in this but in drawing 9 . That is, since what is necessary is just to make it reflect so that the reflected light may not be made to go to a photo detector 23, transparency section 25C of guard-plate 24C of taking-a-seat sensor 20C is good only also considering the part by the side of the photo detector 23 of transparency section 25C as the shape of the spherical surface.

[0035] Next, taking-a-seat sensor 20D shown in drawing 10 and drawing 11 concerning the gestalt of the 4th operation is explained. In drawing 10 , although sensor substrate 21D of taking-a-seat sensor 20D is the same as the gestalt of the 2nd operation of drawing 6 , the configurations of guard-plate 24D differ. That is, guard-plate 24D differs in the configuration of transparency section 25D while the board thickness tD makes it thicker than guard-plate 24B of drawing 6 and enlarges the magnitude of attenuation of infrared light. That is, using the acrylic board of a little thicker light transmission nature, guard-plate 24D cuts internal-surface 25Da of transparency section 25D, and is taken as the semi-sphere side-like concave surface.

[0036] Here, since detection actuation of a detection object is the same as the gestalt of the 1st operation mentioned above, the effect of reflective by guard-plate 24D is explained. In internal-surface 25Da of guard-plate 24D, incidence of the infrared light from a light emitting device 22 is not altogether carried out toward a light emitting device 22 to a photo detector 23. On the other hand, in outside-surface 25Db of guard-plate 24D, a part of infrared light from a light emitting device 22 reflects, and it goes to a photo detector 23. However, since the paths u1 and u2 are long when paths u1 and u2 are passed within guard-plate 24D, the magnitude of attenuation of infrared light is large, and the quantity of light which goes to a photo detector 23 becomes very small. Therefore, there is no effect of the reflected light by outside-surface 25Db of guard-plate 24D. In addition, since the quantity of light of infrared light reflected from a detection object is larger than the quantity of light reflected by outside-surface 25Db of transparency section 25D, there is no trouble in the detection actuation accompanying attenuation of transparency section 25D.

[0037] Next, taking-a-seat sensor 20E shown in drawing 12 and drawing 13 concerning the gestalt of the 5th operation is explained. In drawing 12 , taking-a-seat sensor 20E differs from the gestalt of operation which the configuration which filled up the tooth space between the configuration of guard-plate 24E, and sensor substrate 21E and guard-plate 24E with the filler 29 mentioned above. That is, outside-surface 25Eb of transparency section 25E of guard-plate 24E has become semi-sphere-like. Moreover, the above-mentioned filler 29 is formed from the ingredient (for example, acrylic resin,) of

the light transmission nature of the same refractive index as guard-plate 24E.
[0038] According to the above-mentioned taking-a-seat sensor 20E, since outside-surface 25Eb of transparency section 25E serves as a semi-sphere side centering on the central point Cpa of a light emitting device 22 and the reflected light in the outside-surface 25Db does not go to a photo detector 23 toward a light emitting device 22 altogether, there is no effect of reflective by outside-surface 25Eb of transparency section 25E.
[0039] On the other hand, the tooth space by the side of internal-surface 25Ea of transparency section 25E is filled up with the filler 29, and the ingredient of this filler 29 is an ingredient of the same refractive index as guard-plate 24E. For this reason, since infrared light does not reflect by internal-surface 25Ea of transparency section 25E and it does not go to a photo detector 23, that effect does not exist. In addition, all the tooth spaces of guard-plate 24E including a light emitting device 22 and a photo detector 23 are filled up with a filler 29, and also it may be filled up with it only around the path which goes to a photo detector 23.
[0040] In addition, this invention can be carried out in various modes in the range which is not restricted to the above-mentioned example and does not deviate from that summary.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the toilet bowl using the infrared reflective type sensor and this which are used for the taking-a-seat sensor which detects the existence of taking a seat to a foreign style toilet bowl.

PRIOR ART

[Description of the Prior Art] It has conventionally the light emitting device which emits infrared light, and the photo detector which receives infrared light as this kind of an infrared reflective type sensor, the infrared light emitted from this light emitting device is reflected by the detection object, and the sensor which detects the existence of a detection object based on the detection signal of the photo detector which receives that reflected light is known (JP,6-101260,A).

[0003] Drawing 14 is the outline block diagram showing the infrared reflective type sensor 100. The infrared reflective type sensor 100 is equipped with casing 102, the light emitting device 106 contained by the receipt hollow 104 formed in this casing 102, the photo detector 110 contained by the receipt hollow 108 formed in the above-mentioned casing 102, and the guard plate 112 with which only distance L1 was detached and installed to casing 102 in drawing 14 . The above-mentioned guard plate 112 is formed from the acrylic board of light transmission nature, and is aiming at protection of internal components, such as a light emitting device 106 and a photo detector 110, and improvement in an appearance.

[0004] By the above-mentioned infrared reflective type sensor 100, the range emitted at an include angle theta 1 focusing on a light emitting device 106 serves as the floodlighting area R1, and the range of the include angle theta 2 centering on a photo detector 110 serves as the light-receiving area R2. And if the field with which the floodlighting area R1 and the light-receiving area R2 lap is made into the sensing area R3 (part shown with a broken line) and the detection object T enters in the sensing area R3, the light from a light emitting device 106 will be reflected irregularly on the front face of the detection object T through a path g1, and will go into a photo detector 110 through a path g2. At this time, if the detection signal from a photo detector 110 becomes more than predetermined, it will have judged with there being a detection object T.

[0005] However, even if it is the infrared light which passes along a photo detector 110 by the above-mentioned infrared reflective type sensor 100 most among the infrared light from a light emitting device 106 when it is in the location where the detection object T approached the guard-plate 112 side from the sensing area R3, that is, separates from the sensing area R3, as shown in drawing 15 , i.e., the infrared light which passes through a path g4 from a path g3, it cannot go into a photo detector 110 and the detection object T cannot be detected.

[0006] In order to solve this, as shown in drawing 16 , a guard plate 120 is detached from a light emitting device 106 and a photo detector 110 to distance L2, and there is a means to arrange a guard plate 120 so that the sensing area R3 may be started.

EFFECT OF THE INVENTION

[The means for solving a technical problem, and its operation and effectiveness] Invention of claim 1 made in order to solve the above-mentioned technical problem The light emitting device which emits infrared light, and the photo detector left and installed from this light emitting device, It has a protection member for consisting of an ingredient of light transmission nature, being separated and installed from a photo detector and a light emitting device, and protecting this photo detector and a light emitting device. By receiving the reflected light reflected with the detection object among the infrared light which was emitted from the above-mentioned light emitting device, and passed along the protection member by the above-mentioned photo detector In the infrared reflective type sensor which detects this detection object the above-mentioned light emitting device It is arranged so that the floodlighting area where the infrared light which spreads in the range of the 1st include angle from the core is emitted may be formed. The above-mentioned photo detector While forming the light-receiving area which receives the infrared light of the range of the 2nd include angle from the core The field with which this light-receiving area and the above-mentioned floodlighting area lap is made into sensing area, and it is arranged so that the reflected light may be received, when the above-mentioned detection object is in this sensing area. The above-mentioned protection member It has the transparency section which the infrared light emitted from the above-mentioned light emitting device penetrates, and this transparency section is characterized by being constituted so that the infrared light reflected in this transparency section may not go to the above-mentioned photo detector side while it is arranged so that the part may enter in the above-mentioned sensing area at least.

[0010] In the 1st invention, a light emitting device emits infrared light in the range of the 1st include angle from the core, it is arranged so that the range may be made into floodlighting area, and the photo detector is arranged so that the light-receiving area which receives the infrared light of the range of the 2nd include angle from the core may be formed. And if the range with which floodlighting area and light-receiving area lap serves as sensing area and a detection object is in this sensing area, the infrared light emitted by the light emitting device will be reflected irregularly with a detection object, and will be received by the photo detector. Thereby, a detection object is detected.

[0011] Moreover, although the protection member separated, has been arranged from the light emitting device and the photo detector and has protected the light emitting device and the photo detector, since it is formed with the ingredient of light transmission nature, it does not serve as hindrance of detection of the detection object for letting the infrared light from a light emitting device pass. Moreover, since the protection member is arranged so that a part of sensing area may be started, even if a detection object is in the location close to this protection member, it can detect this.

[0012] Furthermore, a protection member is equipped with the transparency section which the infrared light emitted from a light emitting device penetrates, and this transparency section is formed so that the infrared light reflected in this transparency section may not go to a photo detector. Therefore, since the infrared light which the infrared light emitted from the light emitting device did not reflect in the transparency section, that is, was reflected except the detection object does not enter by the photo detector, the detection signal which was mistaken from the photo detector is not

outputted.
[0013] In addition, as a suitable mode of the transparency section of a protection member, a protection member is formed by the plate and it can realize by considering this protection member as the configuration installed in the inclined include angle.
[0014] Moreover, the front face of the transparency section is formed in a semi-sphere side focusing on a light emitting device as other suitable modes of the transparency section. Thereby, the infrared light reflected on the front face of the transparency section does not go to a return and photo detector side to a light emitting device.
[0015] The 2nd invention prepares the filler formed from the ingredient of the almost same refractive index as the transparency section between the transparency section of a protection member, and a light emitting device, and since the filler has the almost same refractive index as the transparency section, it does not produce the detection result made the mistake in reflection not producing on the front face of the transparency section, and following on the effect.
[0016] In addition, although the infrared reflective type sensor concerning this invention is applicable to various kinds of things, it can be used for the taking-a-seat sensor which outputs the detecting signal for controlling the jet command of the wash water, for example in the health washing station which spouts wash water towards the part of the body. Since the protection member is used in order to prevent contact on the body, this taking-a-seat sensor is suitably applicable.
[0017]
[Embodiment of the Invention] In order to clarify further a configuration and an operation of this invention explained above, the suitable example of this invention is explained below.
[0018] Drawing 1 is the external view of the foreign style toilet bowl with a health washing station which used the infrared reflective type sensor concerning the gestalt of 1 operation of this invention as a taking-a-seat sensor. As shown in drawing 1 , the foreign style toilet bowl 11 is equipped with the health washing station 10, and it is equipped with the case body 12, the control unit 13 prepared in the housing part of the case body 12, the seat 15 and the toilet lid 16 which were supported by the case body 12 free [rotation], and the nozzle 18 for washing which carries out the discharged water of the warm water.
[0019] Moreover, the taking-a-seat sensor 20 is attached in the inside section of the case body 12 of the health washing station 10. This taking-a-seat sensor 20 is an infrared reflective type sensor, and when people sit down to the seat 15, it outputs a detection signal. This detection signal is used as a signal with which jet of wash water is permitted from the nozzle 18 for washing.
[0020] The outline block diagram in which drawing 2 shows the taking-a-seat sensor 20, drawing 3 , and drawing 4 are the explanatory views explaining the detection actuation. In drawing 2 , the taking-a-seat sensor 20 is considering the sensor substrate 21, the light emitting device 22, the photo detector 23, and the guard plate 24 as main configurations. The receipt hollow 26 and the receipt hollow 27 are formed in the sensor substrate 21, a light emitting device 22 is installed in the above-mentioned receipt hollow 26, and the photo detector 23 is installed in the above-mentioned receipt hollow 27.
[0021] The above-mentioned receipt hollow 26 is almost parallel to a guard plate 24, and inclines by include-angle thetak to base 21a of the sensor substrate 21 while it is formed

more deeply than the receipt hollow 27. [of opening 26a of this receipt hollow 26 and opening 27a of the receipt hollow 27]
[0022] Moreover, the above-mentioned guard plate 24 is the plate of the light transmission nature which consists of acrylic resin, it serves as a smooth field so that scattered reflection of the infrared light from a light emitting device 22 may not be carried out, and it has the transparency section 25 which infrared light penetrates.
[0023] In the above-mentioned taking-a-seat sensor 20, the floodlighting area R1 where a light emitting device 22 emits infrared light is range which spreads in opening 26a to include-angle thetaa centering on the central point Cpa of a light emitting device 22, and, on the other hand, the light-receiving area R2 which a photo detector 23 receives is range which spreads in include-angle thetab from opening 27a focusing on the point Cpb of a photo detector 23. And the range with which the floodlighting area R1 and the light-receiving area R2 lap is expressed in the sensing area R3 expressed with the broken line of drawing 2 . The above-mentioned guard plate 24 is arranged so that a part of sensing area R3 may be included.
[0024] Drawing 5 is the block diagram showing the detecting circuit 30 of the taking-a-seat sensor 20. In drawing 5 , actuation of the detecting circuit 30 of the taking-a-seat sensor 20 is explained. Now, power is supplied to a light emitting device 22 continuously or periodically from the drive circuit 31, and infrared light is emitted from a light emitting device 22. If the detection object T is in the sensing area R3 (refer to drawing 2) at this time, it will reflect and incidence of the infrared light will be carried out to a photo detector 23. A photo detector 23 outputs a feeble electrical signal according to the intensity of light by which incidence was carried out. This electrical signal is amplified in an amplifying circuit 32, and is inputted into one input terminal of a comparator 33. The reference voltage of the reference voltage circuit 34 is inputted into the other-end child of a comparator 33. A comparator 33 is outputting a high-level signal, when a detection signal exceeds the above-mentioned reference voltage, and it detects the detection object T.
[0025] Next, the detection actuation by the taking-a-seat sensor 20 is explained. In drawing 3 , if the detection object T1 is in the sensing area R3, the infrared light from a light emitting device 22 is reflected irregularly with the detection object T1, and a part of the reflected lights will go into a photo detector 23, and it will be changed into an electrical signal by the photo detector 23. The electrical signal from a photo detector 23 is electrically processed by the detecting circuit 30 explained by drawing 5 , and the detection object T1 is detected.
[0026] Moreover, it is arranged so that a guard plate 24 may cross a part of sensing area R3, and the location close to a guard plate 24 also serves as the sensing area R3. Therefore, the so-called near-point detection in which the detection object T2 is located near a guard plate 24 can also be performed.
[0027] Next, the effect of the detection actuation accompanying the infrared light from a light emitting device 22 reflecting with a guard plate 24 is explained. In drawing 4 , the infrared light emitted from a light emitting device 22 is reflected in the reflector F1 which overlaps the floodlighting area R1 among internal-surface 25a on a guard plate 24. The point P1 near a photo detector 23 serves as the path G1 which approaches a light emitting device 22 most among this reflector F1. Here, supposing internal-surface 25a of a guard plate 24 is fully smooth and it does not reflect it irregularly, it will reflect the infrared

light which passed through the path G1 to the normal La in a point P1 by angle-of-reflection thetaout1 equal to incident angle thetain1.

[0028] Here, a guard plate 24 inclines by include-angle thetak, and angle-of-reflection thetaout1 is arranged so that the include angle alpha 1 of a path G1 and a reflector F1 to make may become 90 degrees or more, so that the direction left to a photo detector 23 may serve as forward that is,.

[0029] Therefore, the infrared light reflected the point P1 on a reflector F1 goes in the direction distant from the photo detector 23. If similarly infrared light reflects through a path G2 at the point P2 in the reflector F1 distant from the photo detector 23, since an include angle alpha 2 becomes larger than 90 degrees, it will go in the direction further distant to the photo detector 23. Thus, the infrared light emitted from the light emitting device 22 does not perform detection actuation which was mistaken toward the photo detector 23. In addition, since the reflection in outside-surface 25b of a guard plate 24 is the same as internal-surface 25a, the effect does not exist.

[0030] Drawing 6 is the block diagram showing taking-a-seat sensor 20B concerning the gestalt of the 2nd operation. In drawing 6 , taking-a-seat sensor 20B is the same configuration as the gestalt of the 1st operation except the point that the configurations of sensor substrate 21B and guard-plate 24B differ. That is, in sensor substrate 21B, receipt hollow 26B which contains a light emitting device 22, and receipt hollow 27B which contains a photo detector 23 are the same configurations, that is, the configuration of the depth of receipt hollow 26B and receipt hollow 27B, opening 26Ba, and opening 27Ba is the same, and has become the symmetry focusing on the septum section 28 in the meantime. Of such a configuration of taking-a-seat sensor 20B, the floodlighting area R1 and the light-receiving area R2 are the configurations same at include-angle thetaa, and the sensing area R3 is formed in the center section of the floodlighting area R1 and the light-receiving area R2.

[0031] Moreover, the above-mentioned guard-plate 24B is arranged in parallel with base 21a of sensor substrate 21B. It is the part which counters a light emitting device 22 among the above-mentioned guard-plate 24B, and the part which laps with the sensing area R3 has become transparency section 25B. That is, internal-surface 25Ba of transparency section 25B and outside-surface 25Bb are the semi-sphere side which carried out the core of the central point Cpa of a light emitting device 22.

[0032] Next, detection actuation of taking-a-seat sensor 20B is explained. In drawing 7 , if the detection object T1 is in the sensing area R3, as path G3 shows, after it penetrates transparency section 25of guard-plate 24B B, the infrared light from a light emitting device 22 is reflected irregularly on the front face of the detection object T1, and again, it will pass guard-plate 24B and it will carry out incidence to a photo detector 23. Thereby, the detection object T is detected by taking-a-seat sensor 20B.

[0033] Thus, although the infrared light from a light emitting device 22 goes transparency section 25of guard-plate 24B B straight on, as shown in drawing 8 , the part reflects by internal-surface 25Ba of guard-plate 24B. However, since internal-surface 25Ba of transparency section 25B is a semi-sphere side centering on the central point Cpa of a light emitting device 22, all the reflected lights reflected by transparency section 25B go to a light emitting device 22. Therefore, the reflected light reflected by guard-plate 24B does not produce the detection result which incidence is not carried out to a photo detector 23, and was mistaken.

[0034] In addition, although transparency section 25of guard-plate 24B B was formed in the semi-sphere side with the gestalt of the 2nd operation explained using drawing 6 etc., you may be taking-a-seat sensor 20C concerning the gestalt of the 3rd operation shown not only in this but in drawing 9 . That is, since what is necessary is just to make it reflect so that the reflected light may not be made to go to a photo detector 23, transparency section 25C of guard-plate 24C of taking-a-seat sensor 20C is good only also considering the part by the side of the photo detector 23 of transparency section 25C as the shape of the spherical surface.
[0035] Next, taking-a-seat sensor 20D shown in drawing 10 and drawing 11 concerning the gestalt of the 4th operation is explained. In drawing 10 , although sensor substrate 21D of taking-a-seat sensor 20D is the same as the gestalt of the 2nd operation of drawing 6 , the configurations of guard-plate 24D differ. That is, guard-plate 24D differs in the configuration of transparency section 25D while the board thickness tD makes it thicker than guard-plate 24B of drawing 6 and enlarges the magnitude of attenuation of infrared light. That is, using the acrylic board of a little thicker light transmission nature, guard-plate 24D cuts internal-surface 25Da of transparency section 25D, and is taken as the semi-sphere side-like concave surface.
[0036] Here, since detection actuation of a detection object is the same as the gestalt of the 1st operation mentioned above, the effect of reflective by guard-plate 24D is explained. In internal-surface 25Da of guard-plate 24D, incidence of the infrared light from a light emitting device 22 is not altogether carried out toward a light emitting device 22 to a photo detector 23. On the other hand, in outside-surface 25Db of guard-plate 24D, a part of infrared light from a light emitting device 22 reflects, and it goes to a photo detector 23. However, since the paths u1 and u2 are long when paths u1 and u2 are passed within guard-plate 24D, the magnitude of attenuation of infrared light is large, and the quantity of light which goes to a photo detector 23 becomes very small. Therefore, there is no effect of the reflected light by outside-surface 25Db of guard-plate 24D. In addition, since the quantity of light of infrared light reflected from a detection object is larger than the quantity of light reflected by outside-surface 25Db of transparency section 25D, there is no trouble in the detection actuation accompanying attenuation of transparency section 25D.
[0037] Next, taking-a-seat sensor 20E shown in drawing 12 and drawing 13 concerning the gestalt of the 5th operation is explained. In drawing 12 , taking-a-seat sensor 20E differs from the gestalt of operation which the configuration which filled up the tooth space between the configuration of guard-plate 24E, and sensor substrate 21E and guard-plate 24E with the filler 29 mentioned above. That is, outside-surface 25Eb of transparency section 25E of guard-plate 24E has become semi-sphere-like. Moreover, the above-mentioned filler 29 is formed from the ingredient (for example, acrylic resin,) of the light transmission nature of the same refractive index as guard-plate 24E.
[0038] According to the above-mentioned taking-a-seat sensor 20E, since outside-surface 25Eb of transparency section 25E serves as a semi-sphere side centering on the central point Cpa of a light emitting device 22 and the reflected light in the outside-surface 25Db does not go to a photo detector 23 toward a light emitting device 22 altogether, there is no effect of reflective by outside-surface 25Eb of transparency section 25E.
[0039] On the other hand, the tooth space by the side of internal-surface 25Ea of transparency section 25E is filled up with the filler 29, and the ingredient of this filler 29

is an ingredient of the same refractive index as guard-plate 24E. For this reason, since infrared light does not reflect by internal-surface 25Ea of transparency section 25E and it does not go to a photo detector 23, that effect does not exist. In addition, all the tooth spaces of guard-plate 24E including a light emitting device 22 and a photo detector 23 are filled up with a filler 29, and also it may be filled up with it only around the path which goes to a photo detector 23.
[0040] In addition, this invention can be carried out in various modes in the range which is not restricted to the above-mentioned example and does not deviate from that summary.

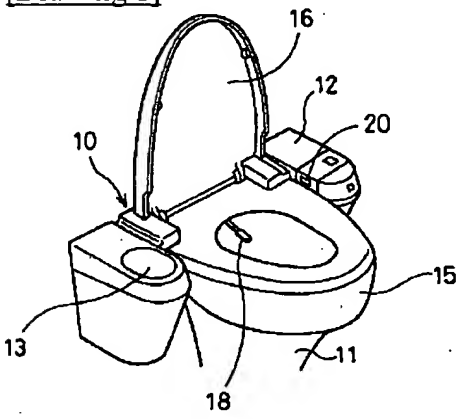
TECHNICAL PROBLEM
[Problem(s) to be Solved by the Invention] However, if a guard plate 120 is made far to distance L2, the infrared light which passed through the path g5 among the infrared light emitted from the light emitting device 106 will reflect with the reflective spot p1 of a guard plate 120, and there is not only a problem that an installation tooth space becomes large, but it will carry out incidence to a photo detector 110 through a path g6. For this reason, although there was no detection object T into the sensing area R3, there was a problem of detecting the detection object T accidentally.
[0008] This invention solves the problem of the above-mentioned Prior art, and it aims at offering the toilet bowl using the infrared reflective type sensor and this which raised the detection precision of a detection object while it can detect the detection object in the location close to a light emitting device and a photo detector.

DESCRIPTION OF DRAWINGS
[Brief Description of the Drawings]
[Drawing 1] The perspective view showing the health washing station 10 which used the infrared reflective type sensor concerning the gestalt of 1 operation of this invention for the taking-a-seat sensor 20.
[Drawing 2] The explanatory view explaining the taking-a-seat sensor 20 concerning the gestalt of the 1st operation.
[Drawing 3] The explanatory view explaining detection actuation of the taking-a-seat sensor 20.
[Drawing 4] The explanatory view explaining the effect of the reflected light of a guard plate 24.
[Drawing 5] The block diagram explaining the detecting circuit 30 of the taking-a-seat sensor 20.
[Drawing 6] The explanatory view explaining taking-a-seat sensor 20B concerning the gestalt of the 2nd operation.
[Drawing 7] The explanatory view explaining detection actuation of taking-a-seat sensor 20B.
[Drawing 8] The explanatory view explaining the effect of the reflected light of guard-plate 24B.
[Drawing 9] The explanatory view explaining taking-a-seat sensor 20C concerning the gestalt of the 3rd operation.
[Drawing 10] The explanatory view explaining taking-a-seat sensor 20D concerning the gestalt of the 4th operation.

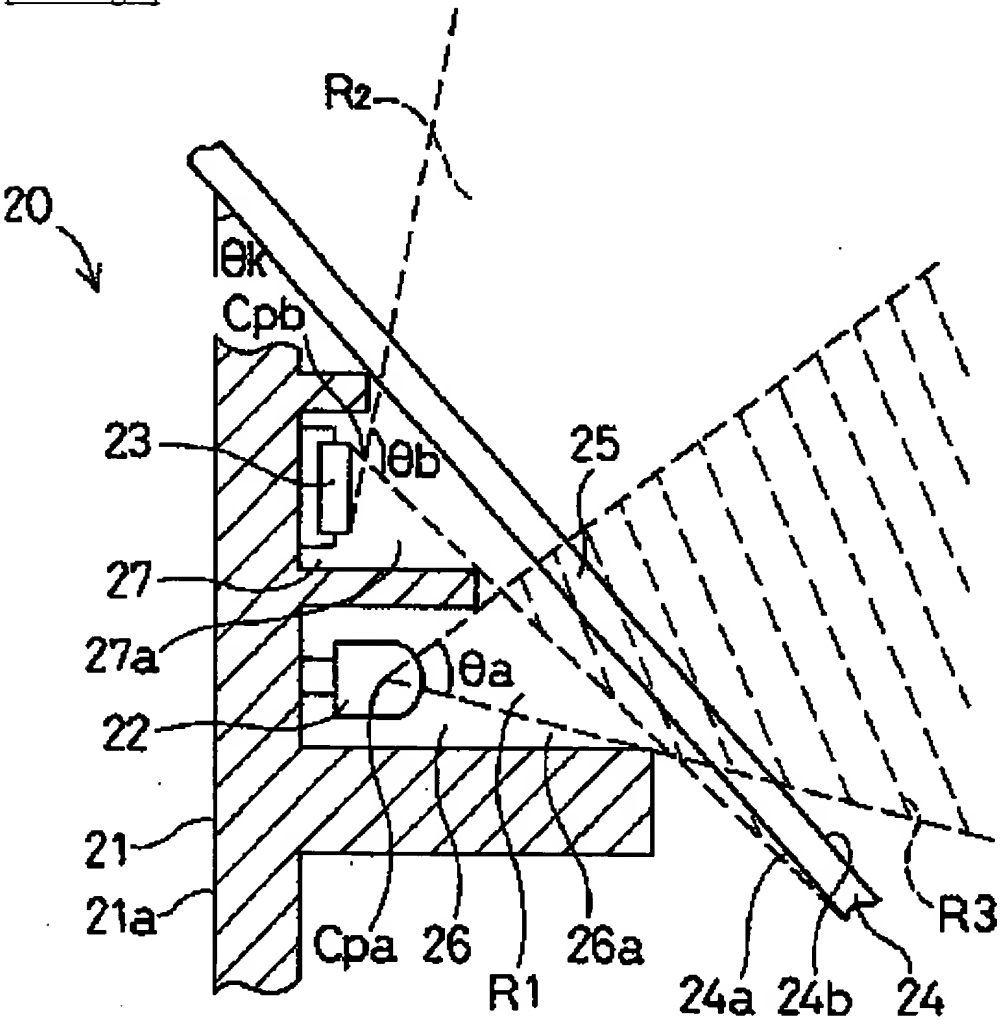
[Drawing 11] The explanatory view explaining the effect of the reflected light of guard-plate 24D.
[Drawing 12] The explanatory view explaining taking-a-seat sensor 20E concerning the gestalt of the 5th operation.
[Drawing 13] The explanatory view explaining the effect of the reflected light of guard-plate 24E.
[Drawing 14] The explanatory view explaining the conventional infrared reflective type sensor 100.
[Drawing 15] The explanatory view explaining the technical problem of the infrared reflective type sensor 100.
[Drawing 16] The explanatory view explaining other conventional infrared reflective type sensor 100P.
[Description of Notations]
T, T1, T2 -- Detection object
F1 -- Reflector
R1 -- Floodlighting area
R2 -- Light-receiving area
R3 -- Sensing area
10 -- Health washing station
11 -- Foreign style toilet bowl
12 -- Case body
13 -- Control unit
15 -- Seat
16 -- Toilet lid
18 -- Nozzle for washing
20 -- Taking-a-seat sensor
20, 20B-20E -- Taking-a-seat sensor
21, 21B-21E -- Sensor substrate
21a -- Base
22 -- Light emitting device
23 -- Photo detector
24, 24B-24E -- Guard plate
25, 25B-25E -- Transparency section
25a, 25Ba, 25Da, 25Ea -- Internal surface
25b, 25Bb, 25Db, 25Eb -- Outside surface
26 26B -- Receipt hollow
26a, 26Ba -- Opening
27 27B -- Receipt hollow
27a, 27Ba -- Opening
28 -- Septum section
29 -- Filler
30 -- Detecting circuit
31 -- Drive circuit
32 -- Amplifying circuit
33 -- Comparator
34 -- Reference voltage circuit

DRAWINGS

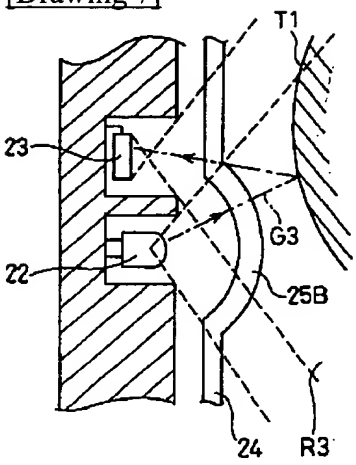
[Drawing 1]



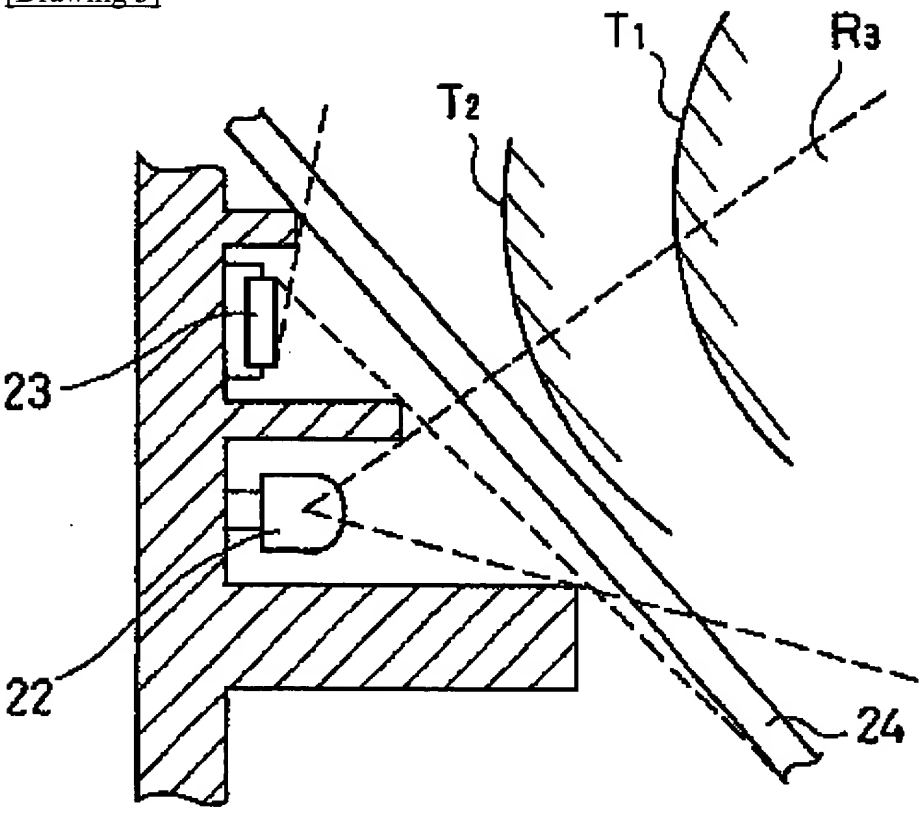
[Drawing 2]



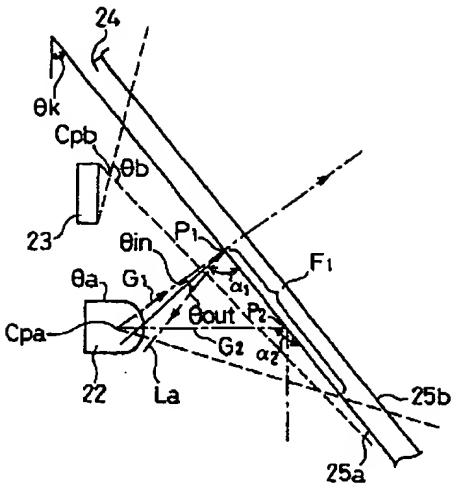
[Drawing 7]



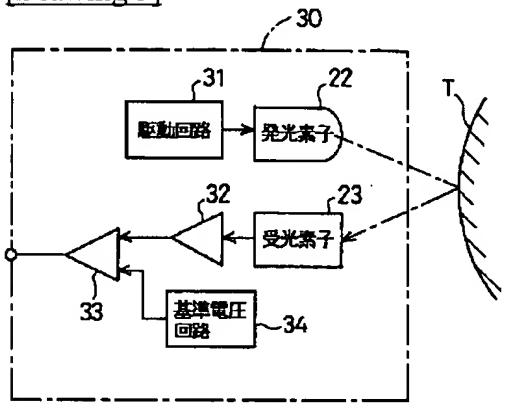
[Drawing 3]



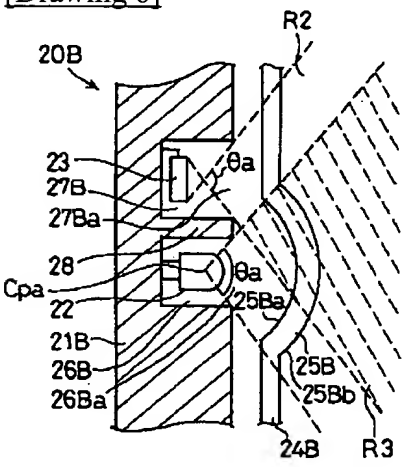
[Drawing 4]



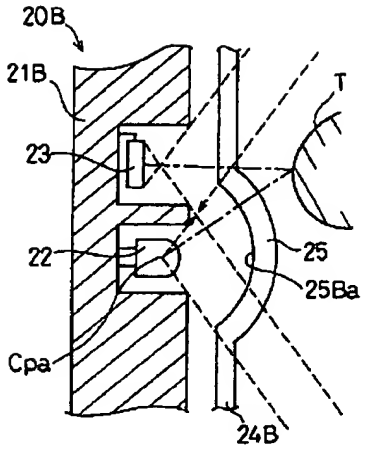
[Drawing 5]



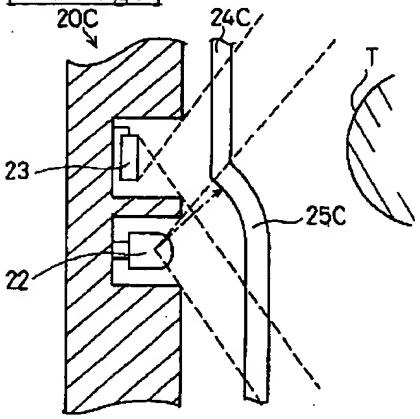
[Drawing 6]



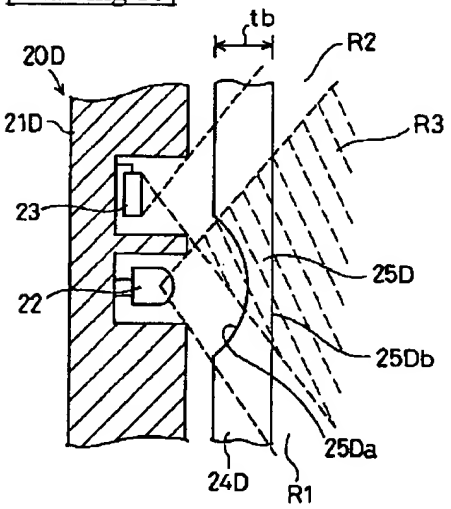
[Drawing 8]



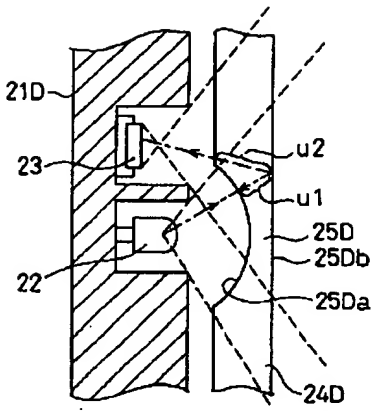
[Drawing 9]



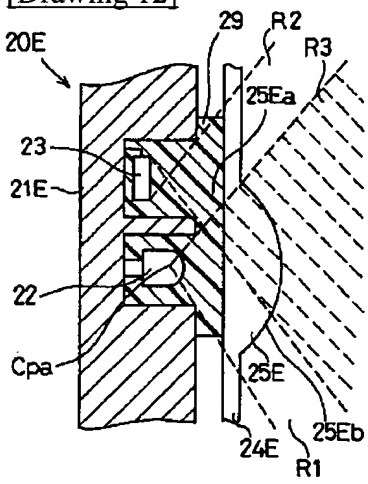
[Drawing 10]



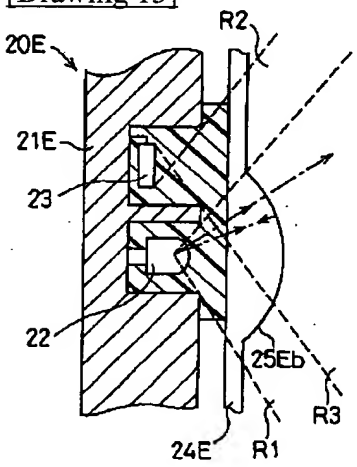
[Drawing 11]



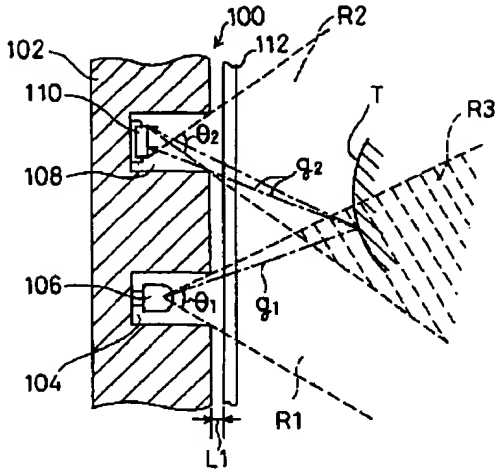
[Drawing 12]



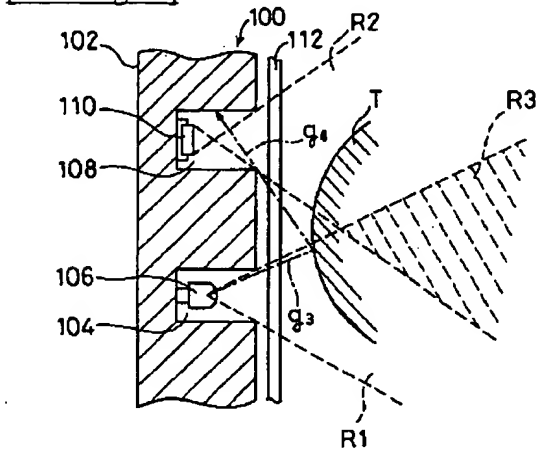
[Drawing 13]



[Drawing 14]



[Drawing 15]



[Drawing 16]